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MATHEMATICS

9709/35

Paper 3 Pure Mathematics 3

May/June 2026

1 hour 50 minutes

You must answer on the question paper.

You will need: List of formulae (MF19)

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- If additional space is needed, you should use the lined page at the end of this booklet; the question number or numbers must be clearly shown.
- You should use a calculator where appropriate.
- You must show all necessary working clearly; no marks will be given for unsupported answers from a calculator.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [].

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[illegible]



- 2** A curve has equation $3x \ln y = x^2 - 4y^3$ for $x > 0$.

Find the gradient of the curve at the point where $y = 1$.

[4]

[illegible]



3 The variables x and y satisfy the equation $yx^a = k$, where a and k are constants.

(a) Show that the graph of $\ln y$ against $\ln x$ is a straight line. [2]

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(b) When $x = 5$, $y = 0.72$ and when $x = 2.3$, $y = 5$.

Find the values of a and k . Give your answers correct to 2 significant figures. [3]

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4 (a) Solve the inequality $|x+4| > |3x-1|$.

[3]

(b) Hence, find the largest integer n for which $|3^{0.05n} + 4| > |3^{1+0.05n} - 1|$. [2]





- 5 A curve has equation $y = \frac{\sin 2x}{3 + \cos x}$ for $0 < x < \pi$.

(a) Express $\frac{dy}{dx}$ as a simplified fraction in terms of $\cos x$.

[4]

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(b) Hence, find an equation of the normal to the curve at the point where $x = \frac{1}{2}\pi$. Give your answer in an exact form.

[2]

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- 6** A curve is such that the gradient of the curve at any point is proportional to the y -coordinate at that point. The curve passes through the points $(2, e^2)$ and $(5, e^3)$.

Form and solve a differential equation to find y in terms of x .

[7]

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- 7** It is given that $\frac{2+ai}{a-3i} = \lambda(1-5i)$, where a and λ are real constants.

(a) Show that $a^2 - 5a + 6 = 0$.

[4]

[illegible]



(b) Hence, find the possible values of a and the corresponding values of λ .

[3]

[illegible]



- 8 (a)** By sketching a suitable pair of graphs, show that the equation $\sec\left(\frac{1}{3}x\right) = 3e^{-x}$ has exactly one root in the interval $0 < x < \pi$. [2]

- (b) The root is denoted by α . Show that $1 < \alpha < 1.1$. [2]

[illegible]



- (c) Show that, if a sequence of positive values given by the formula

$$x_{n+1} = \ln\left(3 \cos\left(\frac{1}{3}x_n\right)\right)$$

converges, then it converges to α .

[2]

- (d) Use this iterative formula, with initial value $x_1 = 1$, to calculate α correct to 3 decimal places. Give the result of each iteration to 5 decimal places.

[3]





- 9 (a)** Express $5 \cos \theta - 3 \sin \theta$ in the form $R \cos(\theta + \alpha)$, where $R > 0$ and $0 < \alpha < \frac{1}{2}\pi$. State the exact value of R , and give the value of α in the form $\tan^{-1}(p)$, where p is a rational number. [3]

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(b) Hence, show that, when α has the value found in **9(a)**,

$$\int_0^\alpha \frac{68}{(5 \cos \theta - 3 \sin \theta)^2} d\theta = \frac{51}{20}. \quad [4]$$

[illegible]



10 (a) Use the substitution $x = 2 \sin u$ to show that

$$\int_0^1 \frac{3x^3}{\sqrt{4-x^2}} dx = \int_a^b 24 \sin^3 u \, du,$$

where a and b are exact values to be found.

[4]





(b) Hence, find the exact value of $\int_0^1 \frac{3x^3}{\sqrt{4-x^2}} dx$.

[4]





11 Relative to a fixed point, O , the points A , B , C and D have position vectors

$$\overrightarrow{OA} = \begin{pmatrix} 2 \\ 3 \\ 5 \end{pmatrix}, \quad \overrightarrow{OB} = \begin{pmatrix} 3 \\ 1 \\ 4 \end{pmatrix}, \quad \overrightarrow{OC} = \begin{pmatrix} -1 \\ 0 \\ -1 \end{pmatrix} \quad \text{and} \quad \overrightarrow{OD} = \begin{pmatrix} -3 \\ 4 \\ 1 \end{pmatrix}.$$

(a) Show that $ABCD$ is a trapezium, and **not** a parallelogram. [4]

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(b) Show that the distance from A to the line through C and D is $\frac{9}{2}\sqrt{2}$. [5]

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(c) Find the exact area of $ABCD$. Give your answer in simplified form. [3]

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